

REMARKS

In the final Office Action of December 5, 2007, claims 1-6, 8, 11-16, 20 and 21 were rejected under 35 U.S.C. 102(b) as anticipated by Giger et al. (USP 5,657,362). Claims 7 and 17 were rejected under 35 U.S.C. 103(a) as unpatentable over Giger and a paper of Johns et al. Claims 9, 10, 18 19, 26 and 27 were rejected under 35 U.S.C. 103(a) as unpatentable over Giger and Manueco Santurtun et al. (USP 4,596,029). Claims 22-24 were rejected under 35 U.S.C. 103(a) as unpatentable over Giger and Saito et al. (USP 5,954,650). Claim 25 was rejected under 35 U.S.C. 103(a) as unpatentable over Giger and Saito in view of the Johns paper. Claims 26 and 27 were rejected under 35 U.S.C. 103(a) as unpatentable over Giger and Saito in view of Manueco Santurtun. Claims 28 and 29 were rejected under 35 U.S.C. 103(a) as unpatentable over the Johns paper and Giger in view of Saito. And claims 31 and 32 were rejected under 35 U.S.C. 103(c) as unpatentable over the Johns paper and Giger in view of Saito and Manueco Santurtun. In addition, claims 1, 2, 4, 5, 7-12, 14, 15 and 17-21 were rejected under 35 U.S.C. 101 as directed to non-statutory subject matter for failing to produce a useful, concrete or tangible result.

Several changes were also required in the drawings. In response to these requirements, replacement sheets are provided for FIGS. 1 and 3 in which lead lines have been provided for elements 130 and 306 and elements 302 and 304 have been underlined as suggested by the Examiner. The objection for failure to abbreviate the view numbers is not understood because the replacement sheets submitted on October 23, 2007 referred to FIGS. 1-7.

Applicants would like to thank Examiner Rashid for the courtesy of a telephone interview which focused on claims 22 and 28 and Giger's U.S. Patent 5,657,362.

To expedite prosecution of this application, applicants have amended claim 1 to avoid the rejection under 35 U.S.C. 101 and to recite certain limitations found in claim 22. Applicants reserve the right to file additional claims as the case law on 35 U.S.C. 101 develops.

The present invention is a variety of methods for processing a medical image so as to produce a processed image from which has been removed certain effects of the physical characteristics of the object being imaged and/or of the apparatus used to form the images. Of particular interest is the removal of fat content in the object being imaged. The invention further provides for the formation of a standardized image from the processed image and for the use of the standardized image in the training of computer-aided detection/diagnosis algorithms. These

algorithms may then be used to detect abnormalities in other standardized images derived from any of a variety of image acquisition systems.

Claim 22 is directed to a method for processing mammographic images. Claim 22 has been amended to recite the processing of a plurality of mammograms formed by different mammography systems to remove the effects of the mammography system and the fat content in the breast being imaged. The resulting images are then converted into standard-form mammograms having pixel values that would have been obtained by a standard form mammography system having a first standard x-ray voltage parameter and first standard exposure parameter.

Claim 28 is directed to a method for processing mammographic images comprising a first step of forming a mammogram of a breast along with images of first and second reference materials having thicknesses that range from 0 to the thickness of the breast where one reference material has an attenuation constant that is approximately the same as that of fat and the other has an attenuation constant that is approximately the same as that of glandular tissue. A first processed image is then formed using exposure information in the images of the first and second reference materials. The processed image is then converted into a standard-form mammogram having pixel values that would have been obtained by a standard-form mammography system having a first standard x-ray voltage parameter and a first standard exposure parameter.

Claim 1, which is directed to processing x-ray medical images, has been amended to recite the step of processing the medical image to generate a standard form version of the image. Claim 1 has also been amended to recite the step of storing the results of the processing. With the recitation of the step of storing the results, claim 1 is believed to satisfy the requirement that the claimed invention be useful, concrete and tangible and therefore statutory subject matter under 35 U.S.C. 101.

A new claim 33 has been added which is similar to claim 22 but recites the processing of mammograms formed on first and second mammography systems.

The primary reference applied against the claims has been Giger (USP 5,657,362). Giger describes a method and system for detection of masses and parenchymal distortion in medical images such as mammograms.

Applicants submit that the claims as amended distinguish over Giger. In particular, while Giger discloses various processing techniques, she does not disclose or suggest the step of

forming a standard form image. The claims remaining in this application all require the formation of a standard form image. Giger does not disclose or suggest such a step in her disclosure in FIG. 8 of a normalization step 804. As indicated at Col. 6, lines 30-32, this step merely normalizes an image so that its average gray level matches the average gray level of the original image. No suggestion is made of applicants' claimed step in claims 22, 28 and 33 of forming an image representative of the image that would be formed at a standard x-ray energy and exposure. Likewise, no suggestion is made of applicants' claimed step in claim 1 of forming an image that would have been obtained by an x-ray device using a predetermined value of at least one operating parameter or physical characteristic..

In his remarks on page 21 of his Office Action, the Examiner responds to applicants' argument by arguing that Giger's original image was formed at a standard x-ray energy and exposure and that Giger's normalization process 804 merely reverts the image back to its original average gray level and therefore the image is at a standard x-ray energy and exposure. Applicants respectfully disagree.

In the first place, there is no indication in Giger that the original image was formed at a standard x-ray energy and exposure.

Second, there is no indication that the image produced by Giger's normalization process is the image that would be produced at a standard x-ray energy and exposure or any other operating parameter or physical characteristic.. What Giger does say about her processing indicates the contrary.

Giger's normalization process 804 is preceded by a subtraction process 803 described at Col. 6, lines 22-26 in which background is subtracted from the dense regions of the breast. As a result, the dense regions of the image are altered relative to the non-dense (or fatty regions). The normalization process presumably is carried out uniformly on the entire image with the result that the effects of the subtraction process at step 803 remain in the normalized image. Otherwise, there would have been no point in performing the subtraction process in the first place. Since the effect of the subtraction process remains after normalization, it is respectfully submitted that the normalized image cannot be characterized as having reverted to its standard x-ray energy and exposure or to any other operating parameter or physical characteristic.

For the above reasons, it is respectfully submitted that Giger's normalized image cannot be characterized as a standard form image or as an image that is formed at a standard x-ray energy and exposure and does not suggest the formation of such an image.

Since each one of independent claims 1, 22, 28 and 33 is limited to a process for generating a standard form version of a medical image or mammogram, each of the independent claims is believed patentable over the references cited.

Claims 22 and 33 are believed patentable for the additional reason that they recite processing images formed on different mammography systems so as to generate images having standard voltage and exposure parameters. Giger does not disclose or suggest such processing.

Dependent claims 4, 5, 7, 9, 10, 23 and 25-27 are believed patentable at least because they are dependent on independent claims 1 and 21.

Claims 28-32 further define over Johns in that they require the use of two reference materials having thicknesses that range from 0 to the thickness of the breast. One reference material has an attenuation that is approximately the same as that of fat and the other an attenuation approximately the same as that of glandular tissue. While Johns may disclose the use of reference materials he does not disclose or suggest the use of such materials with a range of thicknesses.

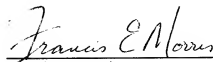
For the foregoing reasons, the claims as amended are believed to be patentable over the references.

Aside from the fee for the extension of time and the RCE, no additional fee is believed to be due for filing this response. However, if a fee is due, please charge such fee to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310.

If the Examiner believes a telephone interview would expedite prosecution of this application, the Examiner is invited to call applicant's attorney at the number given below.

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Respectfully submitted,


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